

ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

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OCTOBER.

[1889.

CXIII.—BAHIA PIASSAVA.

(*Attalea funifera*, Mart.)

A valuable fibre, largely used in this country under the name of Bahia Piassava, is obtained from the leaf-stalks of a Brazilian palm known as *Attalea funifera*, Mart. This palm has a wide distribution in the lowlands of Brazil, and is found throughout the province of Bahia, parallel to the coast, from San Salvador or Bahia in lat. 13° to Caravellas in about lat. 18°.

Para Piassava, which is exported from the port of that name, is slightly different in texture and colour from Bahia Piassava, and is derived from another palm, *Leopoldinia Piassaba*, Wallace. Specimens of both Bahia and Para Piassava, together with appliances used in the industry, as well as finished articles, are shown in the Kew Museum No. II. The excellent series of Bahia Piassava is shown in Case No. 62. One of the earliest notices of Bahia Piassava, and probably the first where the plant yielding it is authoritatively determined, is contained in an article in Hooker's *Journal of Botany and Kew Garden Miscellany*, vol. i. (1849), pp. 121–123. In this notice Sir Wm. Hooker states:—

“ Few have walked the streets of London without remarking that of late years those streets are, in places at least, kept peculiarly neat

L O N D O N :

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“ and clean by the stiff fibres of a new material for making brushes and brooms; those of the machines, as well as those employed by hand; and if anyone is asked what be the origin of this fibre, the frequent reply is, ‘Whalebone, I suppose.’ But, no; it is not of animal but vegetable origin, the coarse fibre of a species of palm (*Attalea funifera*) which grows abundantly in Brazil. This curious material, according to its stoutness and tenacity, is employed for cordage and mats as well as for brooms and brushes. The dilated base of the leaf-stalks separates into a long coarse fringe, which is collected by the natives and used in the country or exported to Europe for the purposes above mentioned, and now constitutes a considerable article of commerce.

“ The fruit or nuts of this palm are another article of commerce, long brought into England under the name of *Coquilla nuts*, and extensively used for various kinds of turnery-work, especially in making handles of bell-pulls, umbrellas, &c., &c.; for the shell (or putamen) is of great thickness, excessively hard, beautifully mottled with dark and light brown, and capable of taking a high degree of polish.”

As far as we are aware, no detailed account of Bahia Piassava has been published in an accessible form. We are therefore happy to avail ourselves of the courtesy of Mr. W. S. Booth, Belle Vue House, Gloucester, who has prepared from personal observation the following excellent account of the present condition of the industry in Brazil for the *Kew Bulletin* :—

“ The fibre of this palm (*Attalea funifera*) is obtained chiefly in the province of Bahia, along the coast south of Valença, where the supply is now exhausted, to Porto Seguro, which will soon be in the same condition.

“ Throughout this tract Piassava is found growing scattered in the woodland (Piassava do Mato), and in some places in extensive patches, called campos, nestling in the heart of immense virgin forests.

“ Naturally, the ‘Piassava do Campo’ is more easily obtained than the ‘Piassava do Mato,’ for while the former grows in spots where it is only interspersed among ferns, it is often necessary to traverse a large tract of country to come upon a sufficient quantity of the latter. Moreover, a certain ‘pratique’ is required to discover the isolated trees at first sight in the dense tangle of a tropical jungle.

“ Piassava of either denomination is divided, according to its age, into two kinds, viz., Bananeira and Coqueira.

“ Bananeiras, or young plants, whose trunks are not yet developed, and which yield a fresh coloured and supple fibre.

“ Coqueiras, or fully developed plants, yielding two or three qualities of fibre, according to its age; viz. :—

- (1.) Ordinary fibre, which is found wound up among the broken leaves, and the upper part of the trunk.
- (2.) Balloon, formed by the older fibre which has fallen to the ground round the base of the trunk.
- (3.) Piassava d’olho, or “eye Piassava,” which is the latest growth, and is in all respects similar to that yielded by the ‘Bananeiras.’

“ The Piassava d’olho, by reason of its flexibility and colour, is used chiefly for tying up and embellishing the bales. Its yield is always small, being about 15 to 17 per cent. of the total ‘pull’ of the tree, which is from $3\frac{1}{2}$ to 5 arrobas (1 arroba = $32\frac{1}{3}$ lbs.) on a fully grown tree.

"This palm grows in the neighbourhood of rivers, and on land that is always in a half swampy condition, being below the flood mark in the rainy season. 'They are erect trees, terminated by a crown of large 'pinnatisect leaves (between which the spathes appear); flowers, 'yellowish, succeeded by ovate or elliptical fruits (drupes), of a brown 'or greenish brown colour.' The hard thick shell of the nut contains two oleaginous edible seeds, and is enclosed in a thin polished fibrous case which is capped at the base like the acorn. The campos, as a rule are not liable to flood, but lying as they do surrounded by swampy land, the conditions of moisture are fulfilled, in which it is necessary for the trees to flourish. The mean temperature of the Piassava district is about 77° F. On reaching the age of six to nine years, the palm begins to bear fibre fit to pull. The present mode of obtaining it is to cut the tree down, and pull the fibre from the trunk afterwards, a very foolish proceeding, considering the time the fallen nuts take to germinate and grow into bearing trees. The base of the petiole of the leaf wraps round the trunk (as can be seen in many other palms) like a sort of fibrous wrapper which splits in the course of the trunk's growth, and falls over on either side. The petiole contains two transverse layers of fibre, the one going up into the midrib of the leaf, and the other to form the wrapper, both protruding in a festooning fringe from the edge of the petiole.

"From this it will be seen that the fineness or coarseness of the fibre depends largely on its position in the petiole, the coarsest fibre lying closest to the midrib.

" *Two commercial kinds of Piassava.*

"There are two kinds of Piassava used in commerce; the round, stiffish fibre from the districts I have mentioned, which is shipped from Bahia, and known as 'Bahia Piassava (*Attalea funifera*); and that collected on the Amazons and the Rio Negro, shipped from Manáos, and Pará, and known as 'Pará Piassava' (*Leopoldinia Piassava*, Wallace, Palm trees of the Amazon, p. 17). This latter is flat, soft, and flexible, altogether differing from 'Bahia' fibre, and commanding on occasions three times its price, which at present stands at 38*l.* for good red fibre.

"In Brazil, these fibres are used for cables, ropes, baskets, hats, tying, fences, and many other purposes; but in this country, and in Europe, solely for brush and broom work, by itself and mixed with other fibres.

"The nuts of the Piassava are exported to Europe for the manufacture of buttons, knobs, &c.

" *Method of Collection and Preparation for the Market.*

"Immediately after the exploration (often very arduous) undertaken to discover crops which will repay the cutting, it is necessary to establish the 'camp,' and to stock it with food and implements indispensable to the men; also to find a pasturage for the animals employed, and a supply of fodder to augment the unsubstantial food that is yielded by the forest. Through failing to take this precaution, the best troops of mules will be reduced in a few months, and the number of sick animals will be considerable; to say nothing of the difficulties which will follow from this false economy.

"As soon as the cutters have arrived in the camp, each takes a different direction, thus endeavouring to secure an advantageous cutting

position, from which, when found, he does his utmost to keep his companions.

"The weighing of the pulled Piassava should be done every fortnight, as the men are furnished on credit at the 'barracão,' and it is well to settle their accounts by weighing their work fortnightly, or so.

"The average cut of one man per diem may be estimated at three arrobas (1 arroba = $32\frac{1}{3}$ lbs.) of loose, *i.e.* unbound Piassava; and the amount of his credit should be based on this quantity. It must be borne in mind that these cutters are not only great hunters, so wasting a day from time to time in the pursuit of game, but they are lazy, and could they obtain unlimited supplies on credit, they would not scruple to abuse such credit on all occasions.

"Though I have estimated the daily work of one man at three arrobas, an inexperienced hand is often unable to clear more than one or two; while on the other hand a very hard worker has been known to clear as much as six arrobas in one day. It is customary to weigh the fibre only in cabeças; that is to say, after it has been made up into the small bundles of which a bale is composed; though, in my opinion, the Piassava thus weighed is much more favourable to fraud than that weighed unbound.

"It may be useful to note here that the cost of binding up the cabeças is 20 reis a-piece (1,000 reis = 27*d.*).

"As limited above, the cutters always do their best to defraud the principals or buyers. They smuggle stones, and pieces of palm inside the mondongas (*i.e.* parcels supposed to weigh 60 kilos or 132 lbs., ready for weighing); they spread the fibre out on the ground, leaving it a long time exposed to the rain; and finally, their shanties being always built by the side of running water, they think nothing of sinking the 'cabeças' in these streams 'end on', so that they may be impregnated with the fine sand brought down by the current. As a 'set off' to this treatment, the buyers are not slow to imitate these edifying examples; they cause their weighing machines to be tampered with before being used, and they allow errors to creep into their accounts, which never result to their own disadvantage.

"As soon as the fibre is weighed, the proprietor sends it down to his fazenda by the mules. The main track is cleared at the expense of the owner of the cutting, and the cutters are obliged to have their fibre weighed on this path, or make a road themselves to the place where they have built their shanty. The mules are usually driven in troops of seven animals to each muleteer, and the weight carried by each mule is six arrobas (194 lbs.)

"Upon arrival at the fazenda the fibre is unfastened, cleaned, and pressed into bales by a packing press, or by hand.

"It is packed into two kinds of bales; viz.—the molho and the fardo.

"The molho is pressed by hand, it contains three or five cabeças, and is bound in five, seven, or nine places. The charge for making these up is 200 reis ($5\frac{2}{3}$ *d.*)

"The fardo contains 10 or 12 cabeças and by reason of its size is packed in the press; costing from 240 to 300 reis per fardo for making up. A good packer will turn out from 18 to 22 molhos daily, and two good workmen can press from 30 to 40 fardos in the same time.

"If the fazenda be on a river the goods are shipped down to the coast town by canoe; a large one holding say 45 to 50 fardos, or about 120 to 130 molhos.

"With very small exceptions for local uses, the whole of the fibre pulled is sent to Bahia to be sold on account of the owners by the consignees.

"The annual export is about 7,000 tons, of which Great Britain takes slightly more than half; Germany coming second with nearly a quarter; while Belgium, France, Portugal, and the Southern Republics together, take the remaining quarter.

"There is an export duty, imperial and provincial together, of 20 per cent. *ad valorem*, which is declared every week, and is assessed on the average weekly prices of the sales made by the brokers.

"Taking into consideration the simplicity of its production (the fibre being ready for the market the moment it is pulled from the tree, and baled), the heavy duty in Brazil, and the high prices realized in Europe, I cannot help thinking that those interested in the development of profitable industries in India, and our other tropical possessions, would find an attempt to transplant the Piassava Palm rewarded ultimately by handsome returns.

"I am greatly indebted to Mr. E. F. Bradley of the Star Brush Company, Holloway, and to Senr. F. E. Blanchet, of the Fazenda Bolandeira, near Canavieiras, for much valuable aid in this inquiry.

"Appendix.

"Export returns of Piassava fibre from Bahia for the year ending January 1889 :—

Great Britain	-	-	535,419
Germany	-	-	289,548
Belguim	"	-	91,385
France	-	-	80,123
Portugal	-	-	36,247
Argentines	-	-	5,730
Uraquay	-	-	5,706
Spain	-	-	1,018
Austria	-	-	727
			<hr/>
			1,045,903 milreis at 27 <i>d.</i> £117,664.

"Two hundred and fifty milreis is payable annually to the Provincial Government for the right of cutting not more than 60,000 arrobas (say 28*l.* 2*s.* 6*d.* for 866 tons). Although 866 tons be the amount specified on the licence, the proprietor is always well satisfied with 100 tons, and rarely gets more from one camp of cutters.

"I append a first-cast account as it may be of some interest or service. I have not taken into consideration the cost of opening up paths through the forest, as this outlay is a very uncertain amount, depending entirely on the character of the obstacles.

“ Office for the information of sugar-producing colonies, it was suggested
 “ that the attention of botanists and sugar planters in such colonies
 “ should be directed to any variations appearing accidentally in the
 “ cane-fields, and that canes exhibiting such variations should be
 “ carefully cultivated with the view of testing their value.

“ 3. The circulation of these and other suggestions from Kew has
 “ apparently been the means of directing attention to the possibility of
 “ securing new varieties of sugar canes, and of generally improving
 “ their yield in crystallisable sugar. Indeed, the correspondence
 “ received at this establishment has shown that the subject has received
 “ attention in such widely remote colonies as Fiji, Queensland, and
 “ Mauritius, as well as in the West India Islands and British Guiana.

“ 4. At Barbados, a series of very interesting investigations has been
 “ carried on for the last four years at the botanical station of the colony,
 “ under the direction of Professor Harrison and Mr. Bovell. These
 “ investigations, supported by the intelligent action of the local govern-
 “ ment, were, in the first instance, confined to trials of various canes
 “ introduced to the West Indies by the botanical establishments of
 “ Jamaica, Trinidad, and British Guiana, and to the yield of these as
 “ compared with the yield of canes already known in the island. The
 “ experiments were also directed to test in an exhaustive manner the
 “ relative value of various manures, and to determine under what con-
 “ ditions such manures were found to yield the best results.

“ 5. A summary of the conclusions arrived at in these investigations
 “ has been regularly published by order of the House of Assembly of
 “ Barbados, and it is needless to refer to them here in detail.

“ 6. These investigations, however, possess a special interest, because
 “ in connexion with them a fact has been observed which it is hoped
 “ will have an important bearing upon the ultimate improvement of
 “ the sugar cane. It has been shown with some probability by
 “ Messrs. Harrison and Bovell, that under certain circumstances it is
 “ possible to raise sugar cane from seed, an occurrence, owing to its
 “ extreme rareness, about which there has been so much doubt that it
 “ has been thought impossible.

“ 7. The first announcement respecting the probability of sugar
 “ canes having been raised from seed at the Barbados Botanical
 “ Station was made in the *Kew Bulletin* for December last. Since
 “ that time further information has been received which appears to
 “ show conclusively that certain varieties of sugar canes still retain
 “ the power of producing mature seed. From a botanical point of view
 “ this is sufficiently interesting to require more than a passing notice.
 “ From the point of view of the sugar planter it is a fact which if
 “ established and intelligently followed up is capable of effecting as
 “ much improvement in the sugar cane and in its yield in sugar as has
 “ been effected in the beet. For the first time it has been shown that
 “ it may be possible to pursue such a system of selection by seminal
 “ reproduction in the case of the sugar cane as to greatly increase its
 “ value as an industrial plant.

“ 8. The economic bearing of the discovery of seedling sugar canes
 “ at Barbados will, however, depend very much upon the means taken
 “ to utilize it to the best advantage. At present Mr. Thiselton Dyer
 “ is of opinion that Messrs. Harrison and Bovell should be encouraged
 “ to devote special attention to the subject of seedling sugar canes,
 “ especially in testing the richness in sugar of the various seedling
 “ canes already established by them. It is hoped that the government
 “ of Barbados, to whom great credit is due for the results already

“ obtained, will, in view of the importance of the subject, be disposed
 “ to support these investigations by such funds as are necessary for
 “ the purpose in view.

“ 9. Now that the fact that certain varieties of sugar canes may
 “ produce mature seed appears to be available for their improve-
 “ ment, it is desirable to carry out a series of detailed and sys-
 “ tematic experiments to determine how far it is possible to cross one
 “ variety with another and to produce a progeny possessing definite
 “ and desirable characters in a larger degree than either parent. This
 “ is a natural development of the present position, but the results
 “ will entirely depend upon the skill and judgment brought to bear
 “ upon them.

“ 10. To assist in this work it may be found desirable to carry on
 “ experiments of the kind suggested in the last paragraph at the
 “ Botanical establishments at Jamaica, Trinidad, and British Guiana.
 “ With this view, and the concurrence of the government at Barbados,
 “ a few of the seedling canes, and if possible, some of the seed might
 “ be distributed to these establishments for the joint observation and
 “ investigations of the botanical and analytical officers connected with
 “ these colonies.

“ 11. As considerable interest is taken in this matter outside the
 “ West Indies, Mr. Thiselton Dyer will be glad to receive a few
 “ seedling canes for experimental cultivation at Kew. Further it is
 “ important from a scientific point of view to obtain specimens of what
 “ is known to be mature seed of the sugar cane, and to place such
 “ specimens for examination and reference in the herbarium attached to
 “ this establishment.

“ I am, &c.,

“ (Signed) D. MORRIS.

“ Edward Wingfield, Esq., C.B.,

“ Colonial Office, S.W.”

CXV.—CINCHONA IN JAMAICA.

In a letter from the Colonial Office dated May 31, 1860, Lord Blachford (then Sir Frederick Rogers) informed Sir William Hooker, by the direction of the Duke of Newcastle, “ that the gentlemen in charge of
 “ the expedition to South America in search of seeds and plants of the
 “ Cinchona tree have been instructed by the Secretary of State for
 “ India in Council, to transmit any seeds that can be spared without
 “ detriment to the supply for India to the Governors of Jamaica and
 “ Trinidad, who have accordingly been requested to make preparations
 “ in suitable spots for the reception of any seeds that may be conveyed
 “ to them.”

The result is recorded in the following quotation from the history of the enterprise given in the Jamaica Handbook for 1889-90, p. 136 :—

“ By the month of October 1861,” Mr. Wilson reported that he had
 “ over 400 plants quite ready for planting out.” As the climate of Bath
 was unsuitable for the successful growth of Cinchona, by the kindness
 of the late Dr. Hamilton, they were tried at Cold Spring Coffee Plan-
 tation, St. Andrew, at an elevation of 4,000 ft. There Mr. Wilson
 found “ the climate and soil to be all he could desire, and as it afforded
 “ every facility for carrying out so valuable an experiment, he at once
 “ availed himself of it, and planted out in the coffee fields on the 16th

" of November 1861 several plants of each species there, about two and two and a half inches in height. In twelve months after a plant of the red bark (*Cinchona succirubra*) had attained to the height of 44 inches, with leaves measuring $13\frac{1}{2}$ inches long, by $8\frac{3}{4}$ inches broad. The same plant in December 1863, i.e., when two years old, measured six feet in height, with 10 branches, having a circumference of stem at base of $4\frac{1}{2}$ inches.

The experience gained in these preliminary attempts paved the way for the larger enterprise undertaken by the Jamaica Government in 1868, from which date *Cinchona* planting in the island took a fresh departure. A further supply of seed consisting of *Cinchona officinalis* and *C. Calisaya* was obtained from Ceylon through Sir Joseph Hooker. Experimental plantations were started by Government "for the purpose of the scientific culture of different species of *Cinchona* and for supplying seeds, seedlings, and plants to private planters." In 1886 the Government *Cinchona* Plantations consisted of nine areas in the Blue Mountain District. The total extent planted with *Cinchona* of all varieties and ages was 143 acres. For the purpose of encouraging the cultivation of *Cinchona* by private enterprise, the Government Plantations during the last few years (*Handbook*, p. 132) "have distributed 1,250 ounces of *Cinchona* seed, 1,200,000 *Cinchona* seedlings, and 469,000 *Cinchona* plants."

Large shipments of *Cinchona* bark were made from the Government Plantations during the years 1879 to 1884, and the prices realized proved that the climate and soil of Jamaica were particularly well suited to the successful cultivation of *Cinchona* plants. As much as 10s. per pound was obtained for root bark of *Cinchona officinalis*, while on large shipments the average price realized was 6s. 7d. per pound. All the various species of *Cinchona* have been introduced to Jamaica including the valuable *Cinchona Ledgeriana*.

About 2,600 acres have been taken up by private planters for the cultivation of *Cinchona* in Jamaica, and the industry there is now well established. Owing, however, to the extraordinarily large shipments of *Cinchona* bark from Ceylon, the value of this valuable drug has so declined in European markets that at present it is almost unremunerative as a cultural product. As Jamaica was late in the field, and only now produces bark of sufficient age to be placed in the market, the planters are compelled to hold back their bark until there is such an improvement in the market as will justify regular shipments. This, it is hoped, will only be a question of time. Meanwhile, as two samples of Jamaica *Cinchona officinalis* bark, from trees six years old, grown on a private plantation at 5,000 feet, have been lately forwarded to Kew, the following reports obtained respecting them will prove of interest:—

DAVID HOWARD, Esq., to ROYAL GARDENS, KEW.

Stratford, near London, E.,

DEAR SIR,

July 25, 1889.

I HAVE completed the analysis of the Loxa bark from Jamaica, and find as follows (as alkaloids):—

	Quinine.	Cinchonidine.	Cinchonine.	Amorphous.
No. 1 -	2.23%	0.44%	0.04%	0.51%
No. 2 -	1.74%	0.57%	0.06%	0.55%

in each case there was a trace of Quinidine.

The tests are thus very much what Loxa bark of similar appearance from South America would give. It is rather a Chaguera than a

crispa or Uritusinga which gives the richer yields that characterises the finest officinalis from the Dodabetta plantations.

On the other hand the percentage of Cinchonidine and Cinchonine do not suggest any hybridization with succirubra.

I am, &c.,
(Signed) DAVID HOWARD.

MESSRS. JENKIN & PHILLIPS to ROYAL GARDENS, KEW.

21, Mincing Lane, E.C.,
29th July 1889.

DEAR SIR,

WE beg to acknowledge the receipt of your letter of the 25th July, enclosing copy of letter received from Mr. David Howard, giving analysis of two samples of Loxa bark from Jamaica.

On the market, now, bark analyzing as under would be worth, No. 1., 2.23 per cent. quinine, $2\frac{1}{2}d.$, $2\frac{3}{4}d.$ per lb.; No. 2., 1.74 per cent. quinine, $2d.$ per lb.

We shall at any time only be too happy to give you any information you may wish for about the market here for Cinchonas.

We may say in passing that the fine old South American H. O. Loxa quills mentioned in the letter by Mr. David Howard, are sold for the French market for making wine. This bark has a peculiar flavour and bouquet, which are recognised and well known by the Parisians, which fragrant quality or bouquet are quite wanting in the Loxa bark when grown in India, Jamaica, or Java. Fine silvery H. O. South American Loxa would fetch upon this market 2s. 2d. to 2s. 6d. per lb.

Thanking you for the sight of these two analyses.

We are, &c.
(Signed) JENKIN & PHILLIPS.

D. Morris, Esq., M.A., F.L.S.

JOHN HAMILTON, Esq., to ROYAL GARDENS, KEW.

c/o Messrs. S. Rucker & Co.,
12, Great Tower Street, London, E.C.,
July 31, 1889.

DEAR SIR,

I NOW return the two copies of reports on the Jamaica bark, the perusal of which has much interested me. I am expecting some improvement in the value of Cinchona later in the year. Those who have good bark should not, in my opinion, be in too much of a hurry to realize. The market now is suffering *more* from a plethora of quinine than a redundancy of bark.

After this season, ending 30th September, I am told the exports from Ceylon will not again exceed eight million pounds, and the fall will come gradually from that point according to supply and demand requirements.

That there can arise any *large* increase in the value of bark during the next 18 months there are at present no grounds for supposing.

Thanking you again for your courtesy,

I am, &c.,
(Signed) JOHN HAMILTON.

D. Morris, Esq., M.A., F.L.S.

The information respecting the use of Loxa bark for wine-making purposes in France is of interest. It would appear from this that while Loxa bark from South America, with "a peculiar flavour and bouquet," is worth 2s. 2d. to 2s. 6d. per pound, a bark apparently similar in appearance and in percentage of quinine from India, Ceylon, or Jamaica is only worth 2½d. to 3d. per pound. The use of Cinchona bark for quinine wine-making can only prove of limited extent, but the subject possesses sufficient importance to deserve to be more fully investigated. Messrs. Jenkin and Phillips have very obligingly forwarded to Kew samples of South American Loxa bark of the character mentioned, and it is hoped to have it carefully tested for the special properties which it is said to possess.

The following letter removes a possible misconception as to the use to which Loxa Cinchona bark is at present applied:—

MESSRS. JENKIN AND PHILLIPS to ROYAL GARDENS, KEW.

21, Mincing Lane, E.C.,

September 20, 1889.

SIR,

WE beg to acknowledge the receipt of your letter of the 19th instant, and presume that you have received the specimen sample of Loxa bark as requested.

We are sorry that we did not make our information so clear as we might have done in our letter to you, but as you justly interpreted it Loxa Cinchona bark (as far as we know) is only used in making a French liqueur, or tonic wine, and is sold by all Parisian apothecaries.

We are told by a Spaniard that the common Pitayo Bark, selling at 2d. to 3d. per lb., is sometimes used for giving sherry a body.

The H. O. and a crown, were brands adopted in the time of the Spanish dominion, for two different sorts of bark which are both included under the general title Crown Bark. It is imported from Payta.

Cortex Chinchonæ de Loxa Loxa bark.

We are, &c.,

(Signed) JENKIN AND PHILLIPS.

W. T. Thiselton Dyer, Esq., F.R.S., C.M.G.

CXVI.—GAMBIER.

(*Uncaria Gambier*, Roxb.)

"Gambier is an article which every tanner in the Kingdom uses " more or less, and no other can take its place." "It used to cost 10l. " per ton and now costs 45l."

It is sufficient to quote these two statements from correspondence which has recently been addressed to this establishment to justify the publication in the *Kew Bulletin* of an account of this very interesting commercial product.

At the present time Gambier is almost exclusively a monopoly of the Straits Settlements, and Singapore is the great emporium for it. The present state of the trade in it would seem to justify its extended cultivation as a planting industry in other parts of the tropics. With this object, copies of the following letter, addressed to Kew by Mr. W. N. Evans, a practical tanner, were sent early in the present year to the botanical authorities in British Guiana, British Honduras, Jamaica, Lagos, Natal, Niger Territory, Singapore, and Venezuela:

Mr. W. N. EVANS, F.C.S., to ROYAL GARDENS, KEW.

66, Stackpole Road, Bristol,

February 1, 1889.

DEAR SIR,

OUR trade has of late years been much interfered with by the difficulty of obtaining pure materials, especially Gambier, *Uncaria Gambier*, from Singapore. The American tanners are also now taking 50 per cent. or more of the supply. The adulteration is very bad, and the price 42s. per cwt., best cube was 27s., block 16s. to 27s. Gambier is an article which almost every tanner in the kingdom uses more or less, and no other can take its place. Its re-actions with lime in the early stages of tanning being so very different from other tannins.

There is, however, now a determination on the part of many to rid themselves of the middlemen who come between them and the growers. We are contemplating, therefore, doing the whole trade. That is to grow the plant in Singapore or Borneo, manufacture with the best machinery, and send direct to warehouses here.

I have taken the liberty of writing to ask if you can give me any information on the subject. There are, I presume, botanical gardens at Singapore, and reliable managers who would furnish us with necessary details. What land was obtainable, difficulties of obtaining labour, &c. Of course we are fully aware that in starting a new scheme we should have to face strenuous opposition from the present dealers. But the trade has all to gain in doing an honest thing. May I also ask could the plant be grown at Natal, at the lower levels near the sea? And might it not be quite possible for the Royal Niger Company to cultivate it from cuttings or seed, as the climate must be somewhat similar as to moist heat?

I am, &c.,

(Signed) W. N. EVANS.

W. T. Thiselton Dyer, Esq., C.M.G., F.R.S.,
Royal Gardens, Kew.

It is hoped that the circulation by means of the *Kew Bulletin* of the information now put together will have the effect of drawing further practical attention to the subject.

The Gambier of commerce is obtained by boiling the leaves of *Uncaria Gambier*, Roxb., a shrubby climber, native of the Malay States. Gambier is official in the British Pharmacopœia under the name of Catechu Pallidum. It is also known as Pale Catechu and Terra Japonica.

The determination of the Gambier plant (*Uncaria Gambier*, Rox. Flor. Ind. 1,517) is fully discussed by Sir Joseph Hooker in the *Flora of British India*, Vol. iii, p. 31. It appears from this that the Ceylon *Uncaria Gambier* of Thwaites' *Enumeratio* is not identical with the true Gambier plant, and is referred to *Uncaria dasyoneura* var. *Thwaitesii*.

Uncaria Gambier is a strong shrubby climber, with opposite leaves, and with numerous small flowers closely crowded on small globular receptacles. The peduncles on which the flowers are borne are of singular structure, and after the fall of the inflorescence the lower portions become elongated, very hard, and curved into hooks by which the plant climbs. Sometimes these curious axillary hooks are produced without bearing any heads of flowers. The numerous seeds are very minute, and with a long transparent tail at each end. The plant is found wild or cultivated in Malacca, Penang, and Singapore, and also in Java and Sumatra.

The first published account of Gambier, according to Flückiger and Hanbury (*Pharmacographia*, p. 336), were communicated to the Batavian Society of Arts and Sciences in 1780, by a Dutch trader named Couperus. This writer narrates how the plant were introduced into Malacca from Pontjan in 1758, and how Gambier is made from its leaves; and he names several sorts of the drug and their prices. In 1807, a description of the drug called "Gutta Gambier," and of the plant from which it is made, was given in the Linnean Transactions, ix. (1808), pp. 218-224. The writer, Mr. William Hunter, Secretary of the Asiatic Society, well known for scientific observations in connexion with India, states that the substance is made chiefly at Malacca, Siak, and Rhio; that it is in the form of small squares or little round cakes, almost perfectly white, and that the finer sorts are used for chewing with betel leaf, in the same manner as Catechu, while the coarser are shipped to Batavia and China for use in tanning and dyeing. It was in doubt till Hunter's paper whether Gambier was the produce of *Acacia Catechu* or of a different plant.

Plantations of Gambier were commenced at Singapore in 1819, where at one time there were 800 plantations; but owing to scarcity of fuel, without which the manufacture is impossible, and the dearth of labour, Gambier planting was, in 1866, fast disappearing. Of late years, owing to an increased demand for the product, and higher prices, Gambier cultivation has rapidly recovered.

Gambier, as at present met with in commerce, is an earthy looking substance, of light brown, and sometimes of a yellow hue, consisting of cubes about an inch each side more or less agglutinated; it is sometimes in flat cakes, or in the form of entirely compact masses. A good series of specimens of Gambier in various forms is shown in the museums of Economic Botany at Kew [No. I., Case 58]. Some Gambier cubes are externally of a reddish brown colour, and compact. Internally they are of a pale cinnamon hue, dry, porous, friable, devoid of odour, but with a bitterish astringent taste, becoming subsequent sweetish. Under the microscope, the cubes of Gambier are seen to consist mainly of very small acicular crystals of Catechin (or Catechucic acid). In respect to the chemical composition, according to Bentley and Trimmen, Gambier is essentially similar to Cutch or Black Catechu, obtained from *Acacia Catechu*. Like Cutch, also, Pale Catechu is said to contain a yellowish colouring matter, which has been named Quercetin.

Although by far the largest consumption of Gambier is in tanning and dyeing, an appreciable quantity of the finer qualities also used in medicine. It is especially valuable as an astringent. It is more readily soluble than the Catechu of *Acacia Catechu*, and is more powerful than Kino.

Pale Catechu or Gambier is largely used in diarrhœa and dysentery, in relaxed conditions of the uvula and palate, and for hoarseness in public speakers and singers.

Hunter states that :—

“For the cultivation of this plant, a rich red soil is preferred. It gives the most luxuriant crop when the rains are frequent, but does not thrive in grounds that are apt to be flooded. On this account the side of a hill is esteemed better than any other situation.

“The plants are propagated from seed.* In three months after sowing, they appear above the ground; after this they grow fast, and

* Simmonds (“Tropical Agriculture,” p. 387), states that the plant is propagated either by seeds or cuttings, but the latter are preferred.

may be moved to the field when nine inches high. They are there planted at the distance of eight or nine feet, so that one *orlong* (of 80 yards square) contains about 700 plants. At the end of one year from the time when they are planted in the field, a small crop of the leaves is obtained. A larger is got in 18 months, and the third at the end of two years, when the bushes have attained their full growth. They continue in their prime, and admit of being cut twice a year, during a period of 20 or 30 years, provided care be taken to keep the ground clean and the roots free from weeds. Their tops must be cut, so as to prevent them from growing to a greater height than five or six feet."

"From good ground and a garden well kept, 10 piculs (of $133\frac{1}{3}$ lbs. each) of dry Gambier are usually obtained on every *orlong* twice a year, or 20 piculs per annum. As it is cut every six months, and should then be boiled off, the leaves ought to be of the same age, but, from a want of means, it often happens that the year is nearly expired before the cutting is done, which should have been made at the end of six months. In this case the young leaves yield a whiter drug than the old."

The following more recent account is taken from the *Tropical Agriculturist* for September 1885, p. 204:—

"When a Chinaman wants to open a garden, the forest is felled and burned off as for coffee, the piece intended for pepper is dug up and prepared most carefully, pepper cuttings planted about eight feet apart, and a jungle post about 10 feet high sunk in the ground beside each plant, to which it is eventually trained. The balance of the clearing has very small holes cut about six feet apart, in which young Gambier plants are put and left to fight it out with the lalang grass (*Imperata Koenigii*), ferns, and other weeds, which soon spring up. In 18 months from planting, the Gambier gives a return which helps the planter until his 1,000 or 2,000 pepper vines begin to give a crop when three years old. On each side of a Gambier and pepper garden there is a reserve of forest eight chains wide, in which he has the right of cutting any timber he may want for posts for his vines, firewood for boiling down his Gambier or for making burned earth, which with the refuse from the Gambier boilers, is the only manure applied to the pepper vines when the garden is any distance from a town. If a little more care was given to the Gambier, there can be no doubt that, not only would the returns be greater, but the garden would last much longer; the Gambier being generally worn out long before the pepper begins to fall."

The following particulars are taken from the *Straits Times* (See *Pharmaceutical Journal*, April, 1888, p. 863.):—

"The main points in Gambier planting which are so attractive to Chinamen, are the great rapidity with which they can get a crop out of the ground, and the small original outlay which is required. . . . The leaf of the young Gambier plant is thick and fleshy, and yields a large quantity of extract; but as the shrub ages the leaves become thinner, and more fibrous in texture, and lose their characteristic fleshiness. In a little over 10 years a plantation is almost valueless, and as a general rule, is abandoned within 15 years. This result is certainly due to the savage treatment to which the shrub is subjected. . . . The shrubs are cut down with no sparing hand; leaves, shoots, and twigs, are all lopped off by the Chinaman's knife, and the plant is well nigh reduced to the condition of a mopstick, and left with barely sufficient leafage to enable it to carry on its existence. No attempt is made to manure the plantation. The

soil, deprived of its natural shade, is left either to be burned into the consistency of a brick, or else the whole place is over-run with *lalang*. The only wonder is that a Gambier plantation is not used up sooner. It is quite an error to suppose that the plant exhausts the soil like indigo. The manufacture of Gambier is as barbarous as its cultivation. The green leaves and shoots are roughly chopped with a *parang* and thrown into a *qualli*, which is then filled up with water; the furnace below the iron pan is of the roughest possible construction, and consumes an immense quantity of firewood. While the leaves are boiling, they are incessantly prodded with a sort of wooden trident in order to break them up, and assist the process of maceration. When the amount of "gutta" which has exuded from the leaves causes the liquor to be thick and syrupy, the leaves are taken out and placed in a wooden trough which overhangs the pan at such an angle, that the liquor drains freely back into the pan from the steaming mass in the trough. The liquor in the *qualli* is then ladled into small and shallow wooden tubs; the leaves in the trough are once more swept into the pan and re-boiled, after which they are taken out and thrown outside to be afterwards carried off to the pepper garden. The liquor left in the *qualli* from the second boiling is too weak to be converted into Gambier, but is an excellent extract in which to boil up the next lot of green leaves. As soon as the extract in the small wooden tubs, already spoken of, is sufficiently cool to allow of the hand being placed in it, a very curious process of agitation is adopted by the Chinese, which it is difficult to clearly describe. The coolie squats before the tub, and plunges his half closed hand into its semi-fluid contents, and in the hollow thus formed by his hand, he incessantly works up and down a piece of light wood shaped like an elongated dice-box. The immediate effect of this treatment, is to cause the Gambier extract to thicken. In fact it sets up a process of crystallization; the extract assumes a concrete form, and becomes *Gambier*. When it is quite cool it is turned out from the tub, as from a mould, and cubed with a knife, which, as a rule, is made out of the iron hooping of a Manchester bale. The cubes are then put on coarse bamboo trays with wide meshes, the trays are placed in rudely constructed racks over the *dapur*, and should be left there for four or five days to get smoke-dried. The cubes at the end of this time, will have thrown off an immense percentage of water, and have become greatly reduced in size. In the ordinary run of Gambier, which merchants are now content to receive, there are no traces of cubing, and when cubes are to be discerned they are of an extraordinary size, the colour is of an unclean white to a dirty pale yellow, and the mass frequently steams."

The account of Gambier preparation given by Fluckiger and Hanbury (*Pharmacographia*, p. 337), differs in some slight details. It is borrowed from Jagor's *Singapore, Malacca and Java*, Berlin, 1866.

"The Gambier plants are allowed to grow 8 to 10 feet high, and as their foliage is always in season, each plant is stripped three or four times in the year. The apparatus and all that belongs to the manufacture of the extract are of the most primitive description. A shallow cast-iron pan about three feet across is built into an earthen fireplace. Water is poured into the pan, a fire is kindled, and the leaves and young shoots, freshly plucked, are scattered in, and boiled for about an hour. At the end of this time they are thrown on to a capacious sloping trough, the lower end of which projects into the pan, and squeezed with the hand so that the absorbed liquor may run back into the boiler. The decoction is then evaporated to the consistence of a thin

syrup, and baled out into buckets. When sufficiently cool, it is subjected to a curious treatment; instead of simply stirring it round, the workman pushes a stick of soft wood in a sloping direction into each bucket, and, placing two such buckets before him, he works a stick up and down in each. The liquid thickens round the stick, and the thickened portion being constantly rubbed off while at the same time the whole is in motion, it gradually sets into a mass, a result which the workman affirms would never be produced by simple stirring round. Though we are not prepared to concur in the workman's opinion, it is reasonable to suppose that his manner of treating the liquor favours the crystallization of the catechin in a more concrete form than it might otherwise assume. The thickened mass, which is said by another writer to resemble soft yellowish clay, is now placed in shallow square boxes, and when somewhat hardened, is cut into cubes and dried in the shade. The leaves are boiled a second time, and finally washed in water, which water is saved for another operation. From information obtained in 1878 it would appear that now the prevailing part of Gambier is made by pressure into blocks.

"A plantation with five labourers contains on an average 70,000 to 80,000 shrubs, and yields 40 to 50 catties (1 catty = $1\frac{1}{3}$ lb.) of Gambier daily."

The United States Consul at Singapore, in view of the more extensive use of Gambier in his country, furnished a report on the industry (*Tropical Agriculturist*, vol. ii., pp. 321, 322), which supplements in one or two particulars the account already given. He states that "Rich Chinese capitalists, known as 'towkays,' upon the arrival of "shiploads of poor coolies from China, either hire them and make "contracts with them for planting and boiling Gambier, or they advance "them money upon condition of obtaining a certain share of the crop, "and take care that they receive the 'lion's share.' By dint of careful "management and great industry some of the coolies that plant on "shares, earn a little more than a living, and invest this in such a "careful manner in something or in some way, that in a few years "they become small 'towkays' themselves, and pretty soon wealthy "ones. There are to-day in Singapore immensely wealthy Chinese " 'towkays,' who were once Gambier-planting coolies.

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"Gambier is exported chiefly for tanneries in Europe and America "as a very excellent substitute for bark. It is also used for dyeing, "and in a purified state for medical purposes. I have also been told "that beer-brewers purchase it, but I have been unable to learn for "what special purpose—I suppose to give beer a dark brown colour; "if so, while it serves to cheat, it is at least harmless if not used too "freely.

"When I first came here Gambier was not largely exported to the "United States, and rather to Europe—England principally. At that "time it vacillated between \$3 to \$3.50 per picul, and that figure "was (for the common usual sort and not for 'cube') not often exceeded until the latter half of 1879, when it gradually rose, owing "to unprecedented demands, to \$4 and over, and this without getting "lower than \$4 to the present time.

"The exports of Gambier to the United States during the last three "years have amounted to \$1,060,619.05. Considering this large "quantity, it must be extensively used in tanning, and must be regarded "at home as a profitable material for that purpose."

From what has been already stated, it would appear that the cultivation and preparation of Gambier in Singapore and adjoining States is very much in the hands of the Chinese coolies, who carry on their operations under a system calculated to impoverish the soil, and produce an article of uncertain quality and often quite useless for commercial purposes. The demand for Gambier appears to be extending both in this country and in the United States, but the supply at present fails to satisfy consumers either as to the quality or quantity.

If the Gambier plant is capable of being successfully grown, and would yield its special product in other localities as well as it does in the Malay States, there is no reason why so valuable an industry should not be introduced to the West Coast of Africa or to such West Indian Colonies as Trinidad and Demerara. It does not necessarily follow that the same wasteful system of cultivation should be adopted in other Colonies. The matter is one which may very fairly be taken up in connexion with experimental cultures in Colonies where the necessary conditions exist for the successful growth of the plant. It evidently requires a deep, rich soil and a high range of temperature, associated with regular and abundant rainfall. In other words, the climate should be tropical. As a guide to those who may be disposed to undertake the cultivation, it may be generally assumed that Gambier will thrive wherever such plants as Cacao, Vanilla, Ginger, and Bananas are successfully cultivated.

In the first instance, seeds might be obtained from the Straits Settlements. Owing, however, to the regular cropping of the leaves, the plants do not ripen seed regularly, and what is produced may be found somewhat shy in germinating. Plants of Gambier have been successfully introduced to the Royal Gardens, Kew. At present they are grown under stove treatment, and appear to be healthy and vigorous. There is not, however, at present any stock for distribution.

In the official statistics of imports into the United Kingdom, Cutch is unfortunately combined with Gambier. The figures for the last three years, are :—

Year.	Tons.	Value.
1886 - - -	28,369	£ 654,438
1887 - - -	27,258	658,364
1888 - " -	28,135	704,731

The *Tropical Agriculturist* (April, 1889, p. 671), however, estimates that Cutch only amounts to about one-fifth of the total imported. Gambier therefore remains as the most important and preponderant tanning material in the commerce of the East.

CXVII.—FIBRE INDUSTRY AT THE BAHAMAS.

(*Agave rigida*, var. *Sisalana*.)

In the *Kew Bulletin* for March last, p. 57, information was given respecting a new Fibre industry at the Bahamas. Since that time specimens of the leaves of the plant have been received at Kew, and it has now been possible to determine the species, as shown in the following letter addressed to the Colonial Office:—

ROYAL GARDENS, KEW, to the COLONIAL OFFICE.

SIR,

Royal Gardens, Kew, 18th July 1889.

WITH reference to your letter of the 14th February 1887, and subsequent correspondence on the subject of the "Pita" Fibre plant of the Bahamas, I am desired by Mr. Thiselton Dyer to inform you that he has lately received from Sir Ambrose Shea specimens of leaves of this plant, which have now enabled us to identify it.

2. When specimens of various fibre plants growing at the Bahamas were forwarded to Kew two years ago, a description of which was forwarded with my letter dated the 16th May 1887, the present plant was not among them. The various species of *Agave* are extremely difficult to distinguish, and it is quite possible that the plant described as No. 1 *Agave lurida* was sent to this country under the impression that it was identical with what is known locally as the "Pita plant."

3. The "Pita" of the Bahamas, which it is hoped will give rise to a successful local industry, from the specimens of leaves that have now reached Kew, is a most interesting and valuable plant. There can be little doubt it is *Agave Sisalana* of Perrine, now generally recognised as a variety of *Agave rigida* of Miller.

4. A good description of the plant, by Engelmann, is quoted in the "*Kew Bulletin* for March 1887, p. 5."

5. This plant has doubtless reached the Bahamas, where we understand it is perfectly naturalized, from Florida and Key West. It is the produce of the plants originally introduced to Florida by Perrine about 40 years ago. The absence of teeth on the leaves, their extreme length (often attaining 5—6 feet), and the robust and free-growing habit of the plant are qualities which render it one of the best, if not the best, fibre plant amongst known species of *Agaves* and *Furcraeas*.

6. The steps already taken of the Governor of the Bahamas to encourage the utilisation of this plant and establish a local fibre industry are fully justified by the intrinsic merits of this *Agave*, and by the reports which have been obtained in this country on the quality and value of the fibre.

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Edward Wingfield, Esq., C.B.,
Colonial Office.

I have, &c.
(Signed) D. MORRIS.